Facilitating Inquiry

INVESTIGATIONS BY FIRST GRADERS

by Jane Bresnick

Imagine stepping into a classroom buzzing with scientific activity. You see children working in small groups on the floor, at tables, in all parts of the room. Heads are bent together in deeply-focused observation or discussion. The language meaningful, occasionally punctuated by the thrill of discovery, "Oh, that's so interesting!" When asked what they are doing, children say: "I'm trying to see if this big ball can knock the blocks down," or, "I want to see which ball can roll the farthest," or, "I wonder if I can make the ball go up the ramp."

These are first graders independently exploring the laws of physics, or, as they experience it, experimenting with balls and ramps. While many educators may be doubtful that children as young as five or six years old have enough background knowledge, skills, stamina, or initiative to engage in independent investigations in science, I have found that they can and will, with great success.

Discussing the design

In my first year doing inquiry in a kindergarten classroom, I focused on my own role as facilitator. I was interested in learning how to guide my students' work and was trying to determine how much to offer into their activities (both materials and advice). After first concentrating on modeling the process skills of inquiry (observing, questioning, interpreting, etc.), I set out this year to use inquiry to teach content, and find ways to assess it.

Exploration: Getting to know the materials

In my first-grade class this year, we began by getting acquainted with the materials and phenomena in a "Balls and Ramps" kit. During this unstructured exploration time, children discovered interesting aspects of how things worked, and their natural interests were sparked. They also formed theories from which questions would later arise.

At first, the class was presented with balls of various sizes and weights, as well as pieces of cardboard, toilet paper rolls, scissors, and tape. The students made roads for their balls. I purposefully did not talk about inclines. Yet, as they worked in pairs, they all designed their own, "hills in their roads." Some experimented with roller coasters, sending their balls not only downhill, but uphill as well. Though they did not yet have the vocabulary to describe what was happening, they were dedicated to making those balls move up and down.

As a group, we took a walk around the room to view the various roads everyone had made, and began to notice differences and similarities. Students shared results of how their balls traveled.

After the students experienced and reflected upon the concept of the "incline,"

I introduced the formal term to them. Because they had already discovered it for themselves, they were able to understand the concept better than if I had showed it to them initially. This gave them a sense of ownership over their discovery.

Because I consider reflection a critical component of inquiry, I asked students to draw and write about their experiments. In drawing and writing, students can look back on what they thought occurred and why. In this case, students were instructed, for homework, to draw the road they had created, show how the ball moved, and write a sentence describing this. The following day we used the homework papers to remind us of our experiences with the balls and roads. The students' work provided various models for recording data.

Building a ramp structure

Observing and learning to ask questions

After my students discovered the concept of the incline, we looked at ways to create different inclines by changing the angle of a board. As we worked, I modeled questioning for the class by asking: "I wonder what will happen if I roll my ball down this ramp?" "I wonder what will happen if I hold the ramp up higher?"

I asked students to try rolling balls on different ramps and observe what happened. It was not important that a particular angle of incline be used, or a particular ball, or even a particular sequence of actions. The pairs of students chose their work space, devised their own ways in which to hold up the board, determined their own pacing, and voiced their own "wonders." Some students went beyond the directed focus, trying out two ramps in a V-shape, rolling a ball down one and watching it roll up the other.

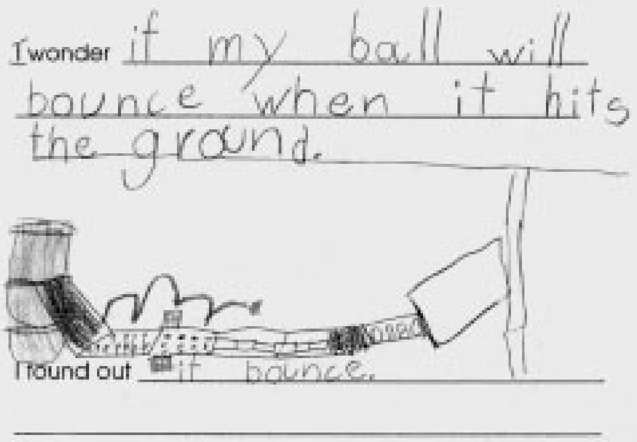
Following these activities, we again came back to the whole group to review. By this time, the children had had enough experience with the materials to focus on some very reasonable "wondering" for further exploration. I wrote down their "I Wonder" ideas on chart paper to remind us of what we were thinking.

More questions and mini-investigations

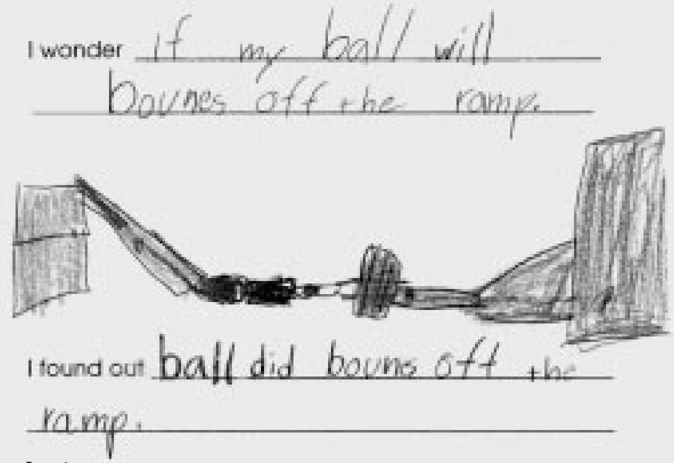
The students' mini-investigations were done in three parts: "I wonder . . ." "My plan . . ." and "I Found Out . . ." We started by reviewing the activities of the previous day. The "I wonder" questions that I had modeled for them received a lot of response from the group. As I expected, they practiced their own "I wonder . . ." questions, thus following through on my modeling. Children began to expect to discover answers to their own questions. The process of investigation became meaningful because the ownership came from student work, not from a worksheet created for them.

With the knowledge the students had acquired through their free explorations, and with the ability to come up with questions that could reasonably be tested, the children were now ready to move forward with their own mini-investigations. After a warm-up brainstorming session, the children were asked to write their questions by following the: "I wonder . . ." template. We used these questions to identify small groups of students with similar interests.

Some students were interested in speed, others in distance, and still others



by Alina



by Jessica

Completed "I wonder" templates

in the force of the rolling ball hitting another object. Next, each group made a plan to answer their "I wonder . . ." question. The plans were explained out loud before the groups began their investigations.

Sharing plans as a group helped the individual children clearly articulate their own plans. The children experienced pride in knowing the distinction between playing and doing a planned investigation. At the end of the period, the students drew and wrote what they found out in their explorations using the "I found out . . ." prompt. This template delineated expectations and helped children reflect upon their investigations. In reviewing these papers with the children, I celebrated their successes, or worked with them to redefine their question or think about other plans.

Lessons learned

After several years of examining my role in facilitating an inquiry-based science unit, I have learned that teacher modeling of the processes of inquiry is the most crucial element.

After being given ample opportunity to freely explore the materials, the students will either continue to "play around" or begin to study and work on meaningful discoveries. What separates true inquiry from play are the processes of observing and questioning, and then developing and following a plan of action. This process leads to more inquiries that are progressively more focused and meaningful.

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Modeling questioning gives the children a sense of what is reasonable to ask, given the constraints of materials available and location in or out of the classroom. Making plans helps students to see ways in which they can use their prior knowledge to seek answers to their questions. Following through with a plan demonstrates the expectation that we really do want to find answers, and that it is possible to do so. The students' belief in this expectation results in better observing, better questioning, and better inquiry practice overall.

As the facilitator I have found that I am able to guide the direction of the students' investigation toward the discoveries of specific content matter. If I want my students to understand that a rolling ball can be a force upon another object which would cause that object to move, I can position a block at the bottom of my ramp and ask, "I wonder what will happen to the block when I roll my ball down the ramp?" Content learning is not accidental in this process. It lies in the carefully guided modeling and questioning of the teacher/facilitator. ✎

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